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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/709,616

11/13/2000

David W. Warren

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4083

7590

06/16/2004

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EXAMINER

LEUNG, JENNIFER A

ART UNIT

PAPER NUMBER

1764

DATE MAILED: 06/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/709,616

Applicant(s)

WARREN ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If no period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 31, 2004 has been entered.

Response to Amendment

2. Applicant's amendment submitted on March 31, 2004 has been received and carefully considered. Claims 1-15 remain active.

Claim Objections

3. Claims 1, 3, 7, 10, 11 and 15 are objected to because of the following informalities:
- In claim 1, -- and -- should be inserted after "helical bed," in line 16.
 - In claim 3, -- the -- should be inserted before "space" (line 3).
 - In claim 7, -- an -- should be inserted before "annular space" (line 3). Also, -- an -- should be inserted before "hourly space velocity" (line 10).
 - In claim 10, -- a -- should be inserted before "helical length" (line 2), and -- an -- should be inserted before "hourly space velocity" (line 3-4).
 - In claim 11, "stem" in line 2 should be changed to -- steam --.
 - In claim 15, "and" in line 3 should be deleted. Also, -- and -- should be inserted after "the generator," in line 6.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, “said exothermic reactor heat” (line 21) lacks proper antecedent basis (i.e., “exothermic reaction heat” is set forth in line 7).

Regarding claim 6, it is unclear as to the relationship between the “heat transfer fins” in line 2 and the “flow guide surfaces” as set forth in claim 1, lines 13-14. (i.e., In applicant’s disclosure, it appears that the heat transfer fins and the flow guide surfaces comprise the same structural element. Did applicants intend to recite, “The combination of claim 1, wherein the flow guide surface comprise heat transfer fins...”?).

Regarding claim 7, it is unclear as to the relationship between “a helical coil” in line 3 and the “flow guide surfaces” as set forth in claim 1, lines 13-14. (i.e., In applicant’s disclosure, it appears that the helical coil and the flow guide surfaces comprise the same structural element. Did applicants intend to recite, “... and wherein the flow guide surfaces comprise a helical coil at said space...”?).

Regarding claim 9, it is unclear as to the relationship between the “inside walls” in line 2 and “an inner wall” set forth in claim 3, line 4.

Regarding claims 13 and 14, it is unclear as to the additional structural limitations applicants are attempting to recite, since the recited structural limitations have substantially been

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incorporated into independent claim 1. Furthermore, it is unclear as to the relationship between “a helical coil” in claim 14, line 2, and the “flow guide surfaces” set forth in claim 1, lines 13-14. (i.e., In applicant’s disclosure, it appears that the helical coil and the flow guide surfaces comprise the same structural element. Did applicants intend to recite, “The combination of claim 1, wherein the flow guide surfaces comprise a helical coil...”?).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collins et al. (U.S. 5,458,857) in view of Amano et al. (JP 62-106834).

Regarding claims 1, 6 and 13-15, Collins et al. (FIG. 3, 4, 6, 7; column 8, line 19 to column 12, line 52; more specifically, column 8, lines 35-53; column 9, lines 35-54) disclose a thermally-integrated water-gas shift reactor comprising, in combination,

- a) a waste-heat recovery steam generator **416** for the recovery of exothermic reaction heat to generate steam; and

- b) an outer region (i.e. comprising low temperature shift reactors **414**) extending about said waste-heat steam generator **416**, defined by an annular space having an inner wall and outer wall (between reforming chamber **422** and vessel **418**);
- c) a catalyst bed (i.e. a suitable low temperature shift reaction catalyst **438**) located within said outer region, and through which reformat gases flow (i.e. reformat flow from upper chamber **462** to lower chamber **464**); and
- d) the outer region **414** being in heat transfer communication with the steam generator **416** to maintain the catalyst bed **438** within a predetermined temperature range for operation of a low temperature shift reaction.

In view of the newly added limitations, Collins disclose, "it is also possible to use other suitable heat exchanger arrangements to transfer heat between the low temperature shift reactors and the steam generator," (column 12, lines 31-39) and suggests "plate fin heat exchanger etc." However, Collins is silent as to said bed comprising "flow guide surfaces" which extend helically and adjacent the catalyst **438**, such that said bed "extends helically" and such that all of the reformat gases flow only helically through the catalyst bed.

Amano et al. teach an apparatus comprising an annular catalyst bed **1** as defined by the space between the outer peripheral surface of an inner cylinder **3** and the inner peripheral surface of an outer cylinder **4**, wherein the annular catalyst bed **1** comprises flow guide surfaces (i.e., spiral plates **15**) that extend helically adjacent to the catalyst, in order to direct all gases introduced through an inlet pipe **9** to flow only helically through the helical catalyst bed **1** and out through pipe **10**. (FIG. 1-3; Abstract). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the "flow guide surfaces" (i.e., spiral

plate 15) of Amano et al. to the catalyst bed in the apparatus of Collins et al., on the basis of suitability for the intended use and absent showing any unexpected results, because the flow guide surfaces function to increase the heat transfer quantity to the catalyst bed, and furthermore, the flow guide surfaces direct the reaction gases to spirally flow through the catalyst bed, thereby shortening the required height of the bed, enhancing the contact probability of the gas with the catalyst, and increasing the reactivity of the catalyst, as taught by Amano et al. (see Abstract).

Regarding claim 2, no further structural limitations are recited, as the operating temperature of generator **416** is not considered an element of the apparatus. In any event, Collins et al. disclose, "The temperature of the steam generator **416** and therefore the temperature of the low temperature shift reaction catalyst **438** is controlled by regulating the temperature of the steam generator **416**," and catalyst **438** is ideally operated at a temperature between 140 °C and 220 °C (equivalent to 284 °F and 428 °F) and possibly a broader range of 110 °C to 250 °C (equivalent to 230 °F to 482 °F). (column 11, lines 7-19; column 12, lines 40-46).

Regarding claims 3-5, Collins et al. (FIG. 3, 4, 6, 7) disclose a suitable low temperature shift catalyst **438** may comprise a Cu/Zn catalyst; the apparatus having an inner wall that is in thermal contact with said generator **416**, such that the boiling water fluid (in water space **432**, steam space **434**) is located proximate the catalyst bed to heat the bed during start-up. As modified by Amano et al. above, the apparatus of Collins comprises a bed **438** that extends helically about generator **416**. (column 8, lines 45-51; column 10, line 68 to column 11, line 46).

Regarding claims 7, 9 and 10, the same comments with respect to Collins et al. and Amano et al. apply (see claim 1 above). However, their collective teachings are silent as to the annular space containing the bed being between 1 and 2 inches wide and the helical length of the

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bed being selected to define a gas hourly space velocity in the range of 500 hr^{-1} to 2000 hr^{-1} . In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate width for the annular space and an appropriate length for the helical bed in the apparatus of Collins et al., on the basis of suitability for the intended use (i.e., for achieving a given production capacity and/or gas hourly space velocity) and absent showing any unexpected results thereof, since it has been held that changes in size involve only ordinary skill in the art, and where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Rose*, 220 F.2d 459, 463, 105 USPQ 237, 240 (CCPA 1955), *In re Aller*, 105 USPQ 233.

Regarding claim 8, Collins et al. disclose catalyst bed **438** is "sufficiently close" to said generator, as evidenced by the catalyst **438** being ideally operated at a temperature between 140°C and 220°C (equivalent to 284°F and 428°F) and possibly a broader range of 110°C to 250°C (equivalent to 230°F to 482°F). (column 11, lines 7-19; column 12, lines 40-46).

Regarding claim 11, Collins (FIG. 3, 4, 6, 7; column 8, lines 54-68; column 11, lines 29-46) disclose generator **416** comprises heat transfer conduits (start-up tubes **417**) that transfer heat from combustion products to boiling water fluid (i.e., in water space **432**, steam space **434**).

Regarding claim 12, Collins et al. (FIG. 3, 4, 6, 7; column 8, lines 36-68; column 9, lines 21-35) disclose generator **416** includes an upright vessel, said outer region **414** having an upper level inlet (via upper chamber **422**) and a lower level outlet (via lower chamber **464**), heat transfer conduit(s) (start-up tubes **417**) extending within said vessel and immersed within boiling water (located within water space **432**, steam space **434**) inwardly of said bed **438**, said conduit or conduits **417** receiving hot products of combustion from a combustion process (i.e. via

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combustion catalyst 429), operable for transfer of heat to the boiling water, for generating steam.

Response to Arguments filed March 31, 2004

6. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection, as necessitated by the amendments to claim 1 and 15, which call for a catalyst bed that extends only helically, there being flow guide surfaces that extend helically adjacent the catalyst to direct all of the reformat gases to flow only helically through the catalyst bed.


Conclusion

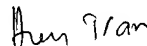
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung

June 13, 2004 



**HIEN TRAN
PRIMARY EXAMINER**